

AN APPARATUS AND METHOD FOR DETECTING RADIATION
THAT USES A STIMULABLE PHOSPHOR

ABSTRACT OF THE DISCLOSURE

Radiation doses ranging from a very weak level to a
5 very high instantaneous level can be monitored real-time by
a differential and integral type of radiation measuring
apparatus in a convenient and precise manner using a
stimulable phosphor as a radiation detecting medium. The
radiation detecting portion comprises in planar super-
10 position a bundle of laterally radiating optical fibers, a
stimulable phosphor, an optical filter centered at the
wavelength of fluorescence, and a bundle of wavelength
shifting optical fibers sensitive to the wavelength of
stimulated fluorescence. On the basis of two actions of
15 the stimulable phosphor, one for emitting stimulated
fluorescence in proportion to the dose of incident
radiation upon illumination with exciting light and the
other for emitting prompt fluorescence upon excitation by
the incident radiation, the radiation detecting portion
20 selectively detects stimulated fluorescence and prompt
fluorescence at specified time intervals. A saturation
check circuit monitors the fluorescence detecting mechanism
at specified time intervals to see if it is saturated by
high-intensity radiation and after it is recovered from
25 saturation, the dose of rapid intense radiation is read
with the quantity of exciting light on the stimulable
phosphor being altered to ensure radiation measurement
without saturation of the fluorescence detecting mechanism.

To read the dose of radiation, the stimuable phosphor is illuminated with pulsed exciting light having a short time duration and the emission of stimulated fluorescence is detected with a photodetector, amplified with a charge-sensitive preamplifier, waveform shaped with a pulse shaping amplifier and passed through an analog/digital converter to provide pulse height data, which is processed by a data collecting and processing circuit to determine the dose of radiation accumulated in the stimuable phosphor.